IOWA DOT GETTING YOU THERE

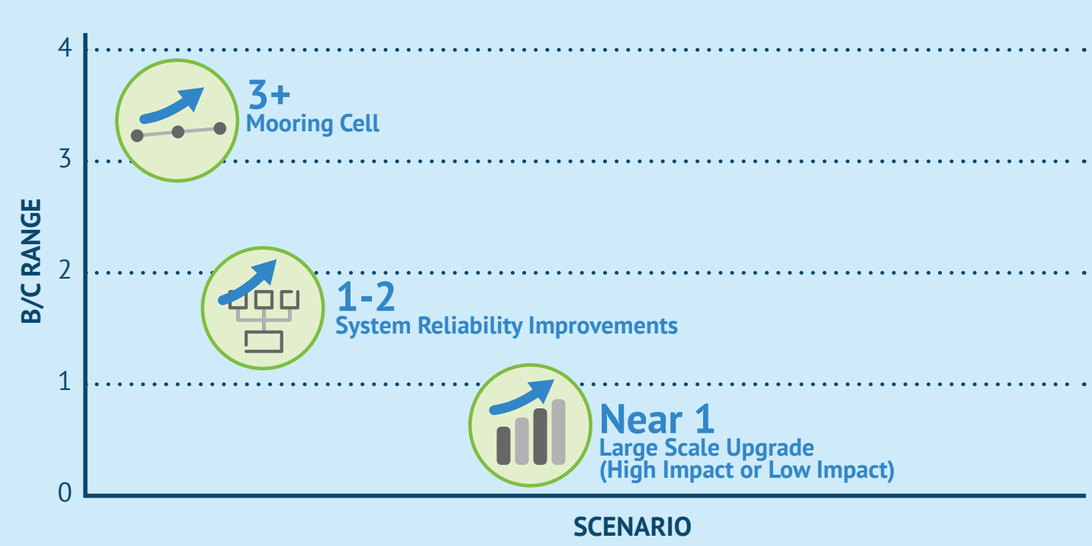
UPPER MISSISSIPPI INLAND WATERWAY INFRASTRUCTURE
PARTNERSHIPS TO TRANSFORM A VITAL TRADE CORRIDOR TO THE HEARTLAND

BENEFIT-COST ANALYSIS

The improvement scenarios were compared using benefit-cost analysis (BCA).

To ensure consistency, the same benefits considered in the economic impact analysis were used for the BCA. A benefit-cost ratio (BCR) greater than one means that benefits outweigh the costs for a particular upgrade scenario. Overall, the analysis showed that the micro upgrade (mooring cell) scenario provides a strong societal outcome given the benefits and costs assessed. Despite the high capital costs and a discount rate of seven percent, system reliability improvements are expected to produce positive social outcomes.

BENEFIT COST ANALYSIS RESULTS, DISCOUNTED AT 7%



CONTACT US

For more information about the economic analysis, please contact Samuel Hiscocks at **samuel.hiscocks@iowadot.us** or **515-239-1004.**

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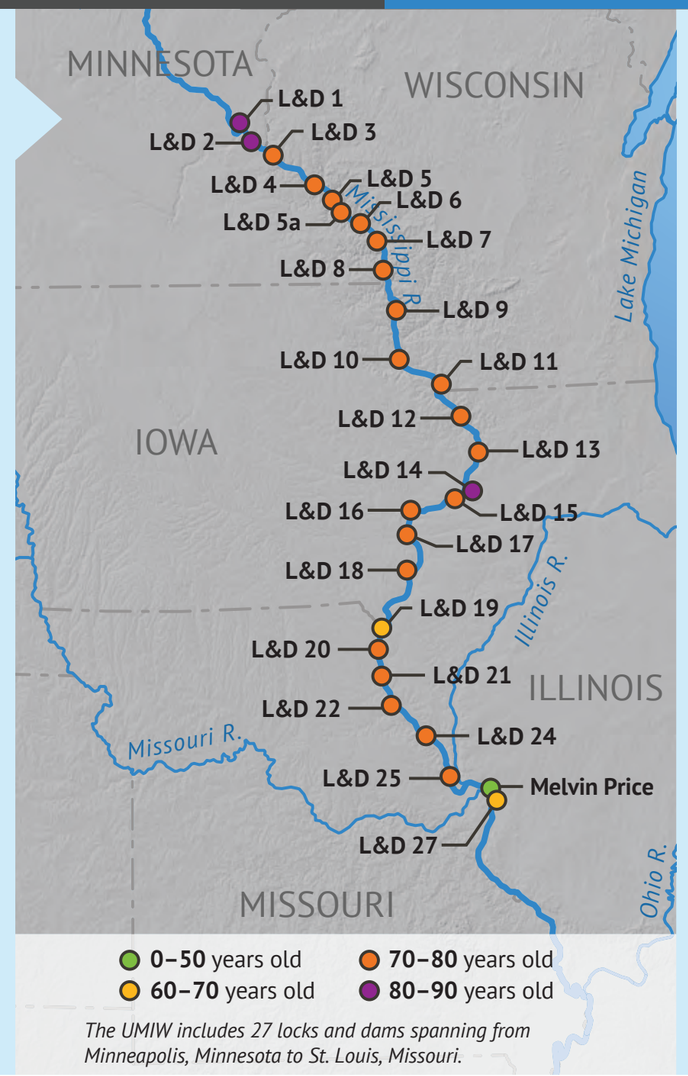
UPPER MISSISSIPPI INLAND WATERWAY

PILOT PROJECT SCENARIOS & ECONOMIC ANALYSIS SUMMARY

The Upper Mississippi Inland Waterway (UMIW) is a vital part of our national inland navigation system and the Upper Midwest economy, and serves as a valuable ecological resource. The 750 miles of navigation channel created by the locks and dams allow waterway traffic to move from one pool to another, providing an integrated regional, national, and international transportation network. The 9-Foot Channel Navigation Project, including the lock and dam system, was constructed in the 1930s and 1940s. The system consists primarily of 600-foot lock chambers that do not accommodate today's modern tows without forcing the tows to split and pass through the lock in two operations. A combination of age, use, and single-lock chambers are also affecting the system's reliability and efficiency and its ability to provide acceptable levels of performance to meet the expanding transportation needs of the Upper Midwest economy.

Modernization of the UMIW for efficient accommodation of modern tow configurations remains unfunded, including congressionally authorized programs as the UMIW and Illinois Waterway (IWW) Navigation and Environmental Sustainability Program (NESP). The NESP provides for improvements in the waterway's capacity to meet future traffic demand.



The UMIW includes 27 locks and dams spanning from Minneapolis, Minnesota to St. Louis, Missouri.

Recent renewals of the Water Resource Development Act (WRDA) are providing opportunities for non-federal interests to advance inland waterway projects. Several Water Resources Reform and Development Act (WRRDA) 2014 and WRDA 2016 sections relate to the use of non-federal funds, public-private partnerships, and non-federal implementation of pilot projects. Congress has not appropriated funds and U.S. Army Corps of Engineers (USACE) administration has not allocated budget to develop implementation guidance for many of the alternative financing provisions. For inland navigation projects, guidance only exists for the acceptance of voluntary contributions of funds or services under existing USACE authorities.

PILOT PROJECTS

The Iowa Department of Transportation has commissioned an alternative financing evaluation that includes three lock and dam system upgrade pilot projects that will improve the reliability, capacity, and efficiency of the existing system with the implementation of alternative financing scenarios. Alternative financing can be:

1 revenue that provides full project funding *or* **2** offsetting funds to existing cost-sharing methods that provide a new source of funds.

The recent WRDA bills and pending federal infrastructure program initiatives have and will likely include provisions for enhanced non-federal stakeholder cost-sharing on federally authorized water resource civil works projects. The three pilot project scenarios are:

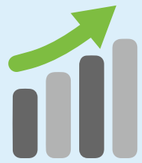
MICRO UPGRADE

A micro (small-scale) navigation efficiency improvement to the UMIW is a stand-alone pilot project and can easily be replicated at additional sites is a mooring cell. A mooring cell is a more efficient and environmentally friendly place for tows approaching a lock and dam to moor (tie-off) while waiting for the lock to become available when another tow occupies the lock or navigation approach channel. A pilot project that installs a mooring cell at Lock 14 will provide notable time savings for upbound towboats, at a design and construction cost of approximately $2 million.

SYSTEM RELIABILITY IMPROVEMENTS

A system reliability improvement pilot project that would reset the design life and enhance the reliability of the lock chambers is re-energizing the Major Rehabilitation Program on the UMIW. The Major Rehabilitation Program is currently underfunded on the UMIW and consists of reliability or efficiency improvements costing over $21 million that focus on facility life extensions that are critical for system recapitalization and the long-term durability and sustainability of the facility. Past UMIW Major Rehabilitation projects have included replacing machinery and control systems, major concrete work, gate and valve replacement and systems to manage ice and scour. Major Rehabilitation Projects must be economically justified by a supporting benefit-cost ratio and documented in an approved Rehabilitation Evaluation Report (RER). No RERs have been completed and approved on the UMIW in the past 15 years, resulting in no new construction. Major Rehabilitation projects are currently 50% cost-shared with the Inland Waterway Trust Fund, a barge industry fuel tax.

LARGE-SCALE UPGRADE



A large-scale navigation capacity and efficiency improvement project on the UMIW would expand lock capacity and improve lock efficiency. A large-scale upgrade could construct one or more of the five UMIW 1,200-foot locks that are authorized by WRDA 2007. The Iowa DOT pilot project scenario includes three locks, Locks 25, 24, and 22, with the construction of a new 1,200-foot lock in the auxiliary miter gate bay adjacent to the existing 600-foot lock chamber. Lock processing and delay times would be reduced with the elimination of double cut lockages, at a design and construction cost of $1.35 billion for the three 1,200-foot locks.

ECONOMIC IMPACT ANALYSIS

In order to understand the economic impacts of the inland waterway system on Iowa and other states along the UMIW, commodity forecasts were developed for input into a regional economic (input-output) model. Benefits from potential improvements to the system were determined based upon delays and fuel consumption. The results show the estimated economic impacts that could be generated if the improvements are made to the waterway system.

MICRO UPGRADE

In determining the economic impacts, operations and fuel savings were considered.

EMPLOYMENT (JOBS)

Impact Type	2018	2030	2060
Direct Effect	0.8	1.2	3.7
Indirect Effect	0.8	1.3	4.3
Induced Effect	0.7	1.1	3.1
Total Effect	**2.3**	**3.7**	**11.1**

ANNUAL GROSS REGIONAL PRODUCT (M 2018$)

Impact Type	2018	2030	2060
Direct Effect	$0.09	$0.13	$0.35
Indirect Effect	$0.09	$0.14	$0.45
Induced Effect	$0.06	$0.09	$0.26
Total Effect	**$0.23**	**$0.36**	**$1.06**

SYSTEM RELIABILITY IMPROVEMENTS

System reliability improvements involve extensive structural work and rehabilitation, replacement of miter gates and other key components, and other projects aiming at increased overall system efficiency and reliability. This scenario considered improvements made at all L&D sites along the UMIW. Savings from reduced delays were used to estimate the economic impacts.

EMPLOYMENT (JOBS)

Impact Type	2018	2030	2060
Direct Effect	134.8	286.6	1,155.3
Indirect Effect	140.3	275.1	1,126.6
Induced Effect	115.9	216.3	824.7
Total Effect	**391.0**	**778.1**	**3,106.7**

ANNUAL GROSS REGIONAL PRODUCT (M 2018$)

Impact Type	2018	2030	2060
Direct Effect	$14.8	$25.1	$88.1
Indirect Effect	$15.1	$29.2	$117.3
Induced Effect	$9.7	$18.2	$69.3
Total Effect	**$39.6**	**$72.5**	**$274.6**

LARGE-SCALE UPGRADE

This improvement would help increase system capacity, reduce tow delays, and help accommodate larger tows. The savings realized through reduced delays were used to estimate the economic impacts from these improvements.

Two potential futures ('low impact' and 'high impact') were considered as part of the analysis. The 'high impact' future assumes that freight rail operators do not react to improvements, which allows the inland waterway system to capture a larger market share. The 'low impact' future considers the reaction of other modes, which would result in a smaller increase in commodities being transported along the inland waterway system and thus fewer economic benefits.

EMPLOYMENT (JOBS) LOW IMPACT

Impact Type	2018	2030	2060
Direct Effect	54.2	115.1	464.1
Indirect Effect	56.4	110.5	452.5
Induced Effect	46.5	86.9	331.3
Total Effect	**157.1**	**312.5**	**1,247.9**

ANNUAL GROSS REGIONAL PRODUCT (M 2018$) LOW IMPACT

Impact Type	2018	2030	2060
Direct Effect	$5.9	$10.1	$35.4
Indirect Effect	$6.1	$11.7	$47.1
Induced Effect	$3.9	$7.3	$27.8
Total Effect	**$15.9**	**$29.1**	**$110.3**

EMPLOYMENT (JOBS) HIGH IMPACT

Impact Type	2018	2030	2060
Direct Effect	54.5	130.1	663.4
Indirect Effect	56.7	124.9	647.0
Induced Effect	46.8	98.2	473.6
Total Effect	**158.0**	**353.2**	**1,784.0**

ANNUAL GROSS REGIONAL PRODUCT (M 2018$) HIGH IMPACT

Impact Type	2018	2030	2060
Direct Effect	$6	$11.4	$50.6
Indirect Effect	$6.1	$13.3	$67.4
Induced Effect	$3.9	$8.2	$39.8
Total Effect	**$16.0**	**$32.9**	**$157.7**

Prepared by Iowa Department of Transportation

June 2018